MODULE VI

Diarrhea
and
Dehydration
ACUTE DIARRHEA

- Increased number of bowel movements!
- Loose and watery stools
- ↑ Fluid and electrolyte loss
ACUTE DIARRHEA TYPES

- Watery
- Bloody diarrhea (dysentery)
DIARRHEA
ETIOLOGY

• Watery
  Rotavirus, Norwalk like viruses, enterotoxigenic *E coli* (ETEC), *Vibrio cholerae*, *Staphylococcus aureus*, *Clostridium difficile*, *Giardia*, and cryptosporidia

• Bloody
  *Shigella* and *Entamoeba histolytica*. *Campylobacter* organisms, invasive *E coli*, *Salmonella*, *Aeromonas* organisms, *C difficile*, and *Yersinia*
DIARRHEA MANAGEMENT

• Maintain appropriate hydration
• Continued feeding
• Drug therapy: limited cases (IMCI)
  – Dysentery /cholera
  – Antiparasitic (amebiasis/giardiasis)
BLOODY DIARRHEA
ANTIMICROBIAL THERAPY

• Bacterial dysentery.
  – Ceftriaxone
  – Azithromycin
  – Quinolones (older children)
  – Ampicillin, TMP-SMX (depending on local resistance pattern)

• Amebiasis /Giardiasis
  – Metronidazole

• Cholera
  – TMP/SMX
  – Doxycycline
  – Tetracycline
PERSISTENT DIARRHEA

- > 14 days (IMCI > 7 days)

- Causes
  - Inadequate diet
  - Malabsorption
  - Parasitosis

- Management
  - Adjust diet
  - Consider antiparasitic agents
DIARRHEA OUTBREAKS (e.g., cholera)

- Epidemiologic surveillance
- SUSPECT! (adults with dehydration)
- Early identification of suspected cases
- Culture confirmation
- Report
- Active investigation and treatment of secondary cases
- Strengthen preventive measures
Severe disease if:

- Newborn (differentiate from transition stools)
- Persistent (> 7 days)
- Bloody
  - Infection
  - Necrotizing enterocolitis
  - DIC (sepsis)
  - Hemorrhagic disease of the newborn
  - Cow’s milk allergy
DEHYDRATION

NEGATIVE WATER BALANCE
(WITH OR WITHOUT
ELECTROLYTIC AND ACID-BASE
DISTURBANCES)
DEHYDRATION CAUSES

- Acute diarrhea
- Vomiting
- Polyuria
- Burn wounds
- Tachypnea
- Fever
- Heat/sweating
DEHYDRATION EVALUATION

ASSESS DEGREE

IDENTIFY TYPE
<table>
<thead>
<tr>
<th>DEGREE</th>
<th>WEIGHT LOSS (%)</th>
<th>0-5 years</th>
<th>&gt; 5 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>MILD</td>
<td>Up to 5%</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>MODERATE</td>
<td>&gt;5 - 10%</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>SEVERE</td>
<td>&gt; 10%</td>
<td>9%</td>
<td></td>
</tr>
</tbody>
</table>
CLINICAL SIGNS
# CLINICAL SIGNS

<table>
<thead>
<tr>
<th>SIGN</th>
<th>MILD</th>
<th>MODERATE</th>
<th>SEVERE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enophthalmos</td>
<td>+/-</td>
<td>+++/++++</td>
<td>++++++</td>
</tr>
<tr>
<td>Mucose membranes</td>
<td>Part. moist</td>
<td>Dry</td>
<td>Very dry</td>
</tr>
<tr>
<td>Tears</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Fontanelle</td>
<td>Normal</td>
<td>Sunken</td>
<td>Sunken</td>
</tr>
<tr>
<td>Thirst</td>
<td>Increased</td>
<td>Intense</td>
<td>Very intense</td>
</tr>
<tr>
<td>Skin</td>
<td>Pink</td>
<td>Pale and cold</td>
<td>Mottled</td>
</tr>
<tr>
<td>Skin turgor (Skin pinch)</td>
<td>Slightly delayed</td>
<td>&gt; 2 sec.</td>
<td>&gt; 4 sec.</td>
</tr>
</tbody>
</table>
## CLINICAL SIGNS (cont.)

<table>
<thead>
<tr>
<th>SIGN</th>
<th>MILD</th>
<th>MODERATE</th>
<th>SEVERE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse</td>
<td>Normal</td>
<td>Increased/ mildly weak</td>
<td>Increased/ Thready</td>
</tr>
<tr>
<td>BP*</td>
<td>Normal</td>
<td>Mild hypotensivee</td>
<td>Shock</td>
</tr>
<tr>
<td>Level of conscious state</td>
<td>Normal</td>
<td>Drowsy</td>
<td>Lethargic/coma</td>
</tr>
<tr>
<td>Capillary refill</td>
<td>&lt; 2 sec.</td>
<td>3 to 5 sec.</td>
<td>&gt; 5 sec.</td>
</tr>
<tr>
<td>Urine output</td>
<td>Reduced</td>
<td>Oliguria</td>
<td>Oligoanuria</td>
</tr>
</tbody>
</table>
TYPE
ISOTONIC DEHYDRATION

Net isotonic loss
↓↓ ECF
OSM normal

H₂O

ECF  ⇐⇒  ICF

Marked clinical signs
TYPE
HYPOTONIC DEHYDRATION

Net hypertonic loss
↓↓↓↓ ECF
OSM ↓

ECF $\xrightarrow{\text{H}_2\text{O}}$ ICF

More marked clinical signs
TYPE
HYPERTONIC DEHYDRATION

Net hypotonic loss
↓↓ ECF
OSM ↑

ECF
H₂O
ICF

Intracellular dehydration
ECF relatively preserved
Less marked clinical signs
HYPERTONIC DEHYDRATION

- History
- Less marked physical signs
- Skinfold sign
- Fever
- Skin: pink and warm
- Late shock
- Very intense thirst
- Irritability
- Seizures
DEHYDRATION
LABORATORY TESTS

SERUM ELECTROLYTES
ACID-BASE STATUS
Blood urea nitrogen (BUN)
UREA IN URINE (U/P)
DEHYDRATION MANAGEMENT

- PLAN A -no dehydration- / B / C -severe dehydration-
- Oral rehydration therapy (ORT)
- Intravenous hydration
  - Expansion (fluid resuscitation)
  - IV hydration
ORT - PHYSIOLOGIC BASES

Diagram showing the transport of sodium (Na+), chloride (Cl-), and glucose across a cell membrane. The transport processes include passive and active mechanisms, with specific enzymes involved in active transport. Tight junctions are also illustrated to indicate the integrity of the cell membrane.
ORAL REHYDRATION ADVANTAGES

- Physiological
- Early refeeding
- Effective in 90-95% of cases; same for all DH types
- REDUCES MORBIDITY AND MORTALITY!
- Low cost, simple implementation
- Accessibility
- No infective, metabolic or electrolytic complications
ORT

RESOURCES

- Room
- Envelopes containing solutions
- Safe drinking water
- Refrigerator
- Clock / Watch
- Paper and pencil
- Scale
- Containers (jar, cups; metered containers); spoons
- NGT
- Trained staff
## ORS - COMPOSITION

<table>
<thead>
<tr>
<th></th>
<th>g/L</th>
<th>mmol/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>NaCl</td>
<td>3.5</td>
<td>90</td>
</tr>
<tr>
<td>KCl</td>
<td>1.5</td>
<td>20</td>
</tr>
<tr>
<td>Na&lt;sub&gt;2&lt;/sub&gt;HCO&lt;sub&gt;3&lt;/sub&gt;</td>
<td>2.5*</td>
<td>30</td>
</tr>
<tr>
<td>Glucose</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>WFI 1 L</td>
<td></td>
<td>111</td>
</tr>
</tbody>
</table>

### Notes:
- * tri-Na citrate, dihydrate 2.9 g/L
- 10 mmol/L
- Total osm. 331 mOsm/L
- * Total osm 311 mOsm/L
**LOW OSMOLALITY ORS**

<table>
<thead>
<tr>
<th>Component</th>
<th>g/L</th>
<th>mmol/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>NaCl</td>
<td>2.6</td>
<td>75</td>
</tr>
<tr>
<td>Gluc. (anhidre)</td>
<td>13.5</td>
<td>65</td>
</tr>
<tr>
<td>KCl</td>
<td>1.5</td>
<td>20</td>
</tr>
<tr>
<td>tri-Na citrate, dihydrate</td>
<td>2.9</td>
<td></td>
</tr>
<tr>
<td>Total weight</td>
<td>20.5</td>
<td></td>
</tr>
</tbody>
</table>

Total weight: 20.5 g/L  
Total OSM: 245 mOsm/L
NORMOHYDRATION
ORS ADMINISTRATION

PLAN A (AT HOME)

• Give more fluids than usual
• ORS with each diarrheal stool passed / vomit
  - < 2 years: 50 – 100 mL
  - > 2 years: 100 – 200 mL
• Continued feeding/ breast-feeding
• Follow-up / Alarm signs
ADEQUATE FEEDING/BREASTFEEDING!
CONTINUED BREAST-FEEDING
ORS ADMINISTRATION
**ORAL REHYDRATION CONTRAINDICATIONS**

- Shock
- Age < 1 month
- Functional obstruction/ Ileum
- Bilious emesis
- Severely impaired consciousness
- Severe respiratory distress
- Tense and/or tender abdomen
ORS ADMINISTRATION

PLAN B

• According to weight:
  50 - 100 mL/kg in 4 hs

• According to age (in 4 hs):
  < 4 mos: 200-400 mL  4 - 12 mos: 400-700 mL
  1- 2 yr: 700-900 mL  2- 5 yr: 900-1400 mL

• Every 30 minutes (if well tolerated)

• Continued monitoring; re-assess at 4 h

• Switch to Plan A when patient has normal hydration
VOMITING DURING ORT
SMALLER SIPS
INCREASE INTERVAL BETWEEN THEM
NGT

Gavage (gravity): 20-25 mL/kg/h every 20 min
Drip: 5 macrodrops/kg/min, in 30 min
ORAL REHYDRATION FAILURE

- Worsening of clinical signs
- Loss of fluids greater than intake
- Persistent vomiting
- Significant abdominal distension
- Persistence of dehydration after 6 h
HYDRATION PLAN C

• Shock:

  Intravascular volume expansion

  Isotonic crystalloid solution: 20 mL/kg, as rapidly as possible*

  OR

  30 mL/kg  70 mL/kg
  < 12 mos.  1 h *  5 h
  1 - 5 years 30 min * 2½ hs

*Repeat if shock signs persist

Alternative: ORS via NGT 20-25 mL/kg/h; in 6 h
PARENTERAL HYDRATION
HYPERTONIC DEHYDRATION

• Replace previous deficit in 36-48 h:
  50% in the first 24 h

• Reduce natremia by 10-12 mEq/L in 24 h:

• Begin with solutions at 70 mEq/L of Na until diuresis is achieved; then reduce to solutions with:
  
  Na 40 mEq/L
  
  K  30 mEq/L
ENHANCING ORT IN A HUMANITARIAN EMERGENCY SETTING

• Prepare a specific ORT area in each health facility
• Teach the population the adequate technique for ORT
• Consider cultural features and issues of the affected population
• Epidemiologic surveillance registry
Anticipate needs in the rehydration posts according to the population affected by the disaster

Determine degree of dehydration and proceed

Initiate ORT, except in cases of severe dehydration

Reinitiate feeding immediately after rehydration

Antibiotic treatment only for dysentery or if cholera is suspected

NO antiemetics/ antidiarrheics
THANK YOU!